## Crystal growth and magnetic properties of hexagonal $Ba_4CuNb_3O_{12}$ single crystal

Yuhu Huang<sup>1</sup>, Wen Xie<sup>1,2</sup>, Fei Zheng<sup>3</sup>, Chao Zhang<sup>4\*</sup>, and Han-Shu Xu<sup>2,1\*</sup>

<sup>1</sup>Hefei National Research Center for Physical Sciences at the Microscale, University of Science and Technology of China, Hefei 230026, China

<sup>2</sup> Department of Applied Physics, Anhui Medical University, Hefei 230032, China

<sup>3</sup> School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026, China

<sup>4</sup> Instrumentation and Service Center for Physical Science, Westlake University, Hangzhou 310024, China

zhangchao68@westlake.edu.cn xhs@ustc.edu.cn



Fig. S1 The ratio of metal elements in  $Ba_4CuNb_3O_{12}$  single crystals.



Fig. S2 XPS spectral of  $Ba_4CuNb_3O_{12}$ . (a) Ba 3d spectral. (b) Nb 3d spectral. (c) Cu 2p spectral. (d) O 1s spectral.



Fig. S3 Schematic diagram of superexchange interaction of different Cu ions.



Fig. S4 The real part of AC susceptibility  $\chi'$  of Ba<sub>4</sub>CuNb<sub>3</sub>O<sub>12</sub> single crystal at different frequencies.